

*1937 generator assembly at  
the Bonneville powerhouse.*

# Chapter 7 Columbia River Multi-Purpose Development in the 1930s

## National Conservation Movement

The completion of the jetty at the mouth of the Columbia and the 30-foot navigation channel from Portland to the sea brought to a close the first half century of the Portland District. The highlights of the period were the large projects undertaken to aid navigation: the Cascades Canal and Lock; channel improvement and maintenance on the Columbia, Willamette, and other rivers; The Dalles-Celilo Canal; improvements on the Oregon Coast; and the great jetties at the mouth of the Columbia. These works were prerequisite to the commercial development of Oregon and southern Washington.

During the 1930s, the Portland District participated in the inception of two major programs. In those years, the Corps of Engineers began taming the mighty Columbia River by huge multiple-purpose dam projects. The flood control system constructed in the Willamette River Valley constituted the other major project of the District during the second half of its first hundred years.

The background to the basin-wide development of the Columbia River lies partly in the national conservation movement. The wasteful use of the nation's natural resources in the 19th century—soil, water, trees, wildlife, and minerals—by private interests was matched by apathetic and narrow political leadership. Questions of natural resource conservation first attained public prominence during the administration of President Theodore Roosevelt. The despoilment during the previous century prompted Roosevelt to advocate the policy that public ownership of the nation's natural resources must be affirmed and that close and continuous regulation of private development of resources would be essential to prevent their destruction and monopolization.

Under the leadership of Gifford Pinchot, Chief of the Forest Service, national forest holdings increased five-fold to nearly two hundred million acres. Reclamation projects began in the West. New laws regulated grazing and mining on the public lands. The first inventory of the nation's resources was taken. The President sponsored numerous conferences to explain and publicize the problem involved. Newspapers and journals picked up the theme, and the Congress of 1907 became known as the Conservation Congress.<sup>1</sup>

Roosevelt's speeches urged development of the nation's rivers. Above all he insisted that "every stream is a unit from its source to its mouth, and . . . all its uses are interdependent."<sup>2</sup> In characteristically forceful language, Roosevelt's vetoes of Congressional private power dam bills in 1908 and 1909 affirmed the public interest in American rivers:

*The present policy pursued in making these grants is unwise in giving away the*



President Theodore Roosevelt with John Muir at Yosemite in 1903.

*property of the people in the flowing waters to individuals or organizations practically unknown, and granting in perpetuity these valuable privileges in advance of the formulation of definite plans as to their use.<sup>3</sup>*

In his James River veto, President Roosevelt stated:

*When the public welfare is involved, Congress should resolve any reasonable doubt as to its legislative power in favor of the public and against the seekers of special privilege . . . . The people of the country are threatened by monopoly far more powerful because in closer touch with their domestic life than anything known to experience . . . . I esteem it my duty to use every endeavor to prevent this growing monopoly, the most threatening which has ever appeared, from being fastened upon the people of this nation.<sup>4</sup>*

The failure of the Bull Moose party, the indifference of the Taft administration, and the threat and eventual outbreak of World War I during Wilson's administration halted work in conservation and resources planning. Ironically, not until the 1920s—a period generally associated with the doctrines of laissez-faire—did the national government, through the Corps of Engineers, engage in large-scale regional resources planning. A central focus of such effort was the Columbia River Basin.

Previous to federal involvement on the Columbia, numerous state or local organizations had generated interest or initiated programs for development of the river. Citizens groups offered competing proposals. The State of Washington sponsored surveys and promoted a major irrigation project in the Upper Columbia Basin. Interstate compacts were formed. Newspapers, notably the *Wenatchee Daily World*, campaigned for action. The issue was prominent in state and Congressional elections. All of these efforts utilized the information produced by the many surveys of the river made by the Corps of Engineers, including the Symons expedition of 1881.<sup>5</sup>

## “308 Report”

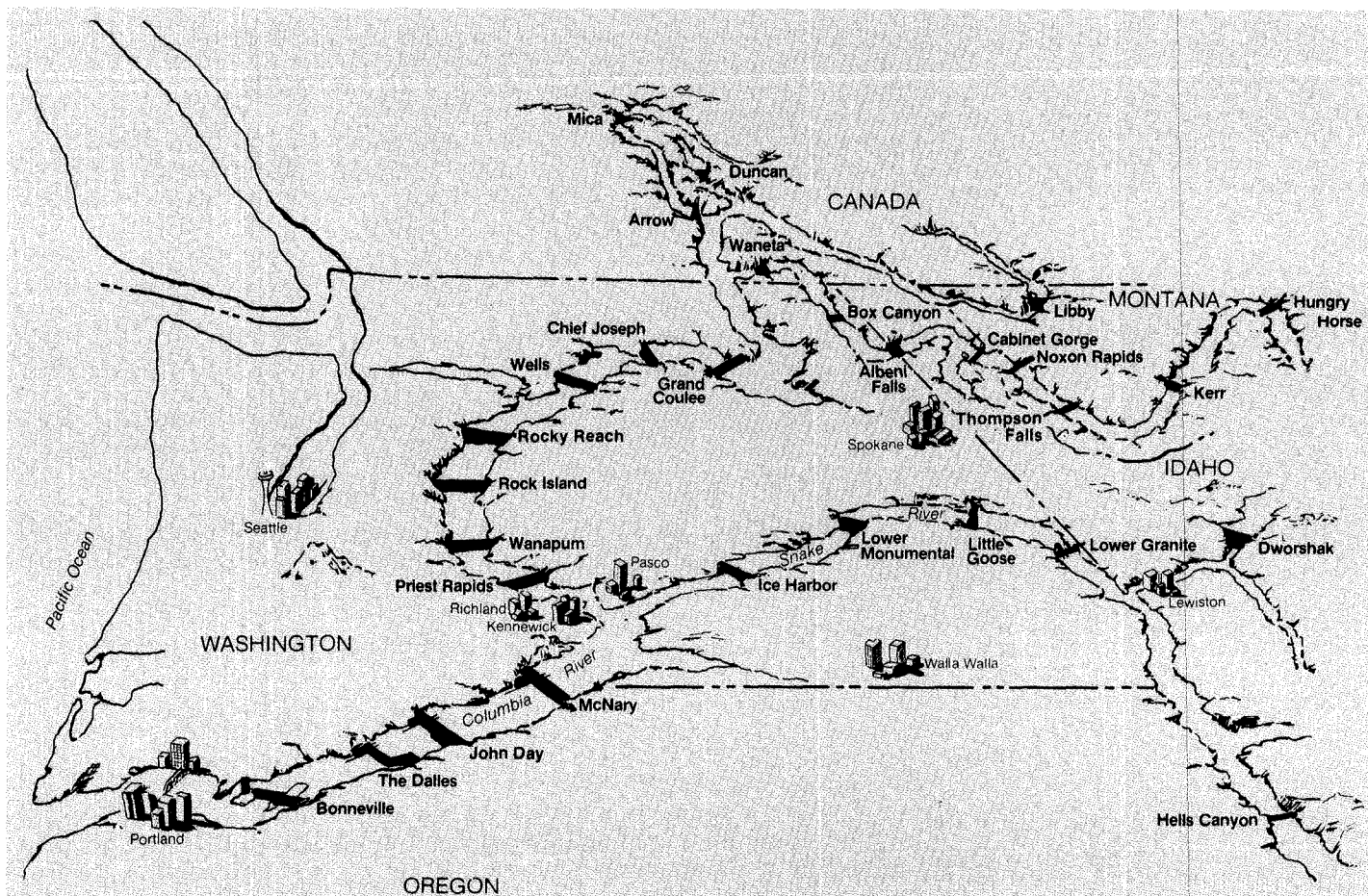
In March 1925, the River and Harbor Act directed the Corps of Engineers and the Federal Power Commission (established in 1920 for, among other things, the issuing of licenses for projects on navigable rivers) jointly to estimate for Congress the costs of surveys of those navigable streams “whereon power development appears feasible and practicable.” They were to formulate “general plans for the most effective improvement of such streams for the purposes of navigation . . . in combination with the most efficient development of the potential water power, the control of floods, and the needs of irrigation.”<sup>6</sup> In April 1926, the Corps submitted to Congress a list of rivers across the nation worthy of detailed investigation. This became the now famous House of Representatives Document 308. Prominent in the report of ten river basins was the Columbia River and its principal tributaries.<sup>7</sup>

The River and Harbor Act of 1927 directed the Corps of Engineers to make the surveys recommended in House Document 308.<sup>8</sup> These surveys proved a massive undertaking for the North Pacific Division engineer districts. The Seattle District had the responsibility for the survey of the Columbia above the Snake River, while the Portland District studied the Columbia below that point. The Division Engineer was assigned a supervisory and coordinating role over the work of the two districts. Much of the time spent on the survey until the summer of 1929 consisted of defining the Congressional intent as to the scope and amount of detail to be covered in the comprehensive report, together with an estimate of the expense involved. The Chief of Engineers pressed the district and division engineers to speed up the preliminary work and avoid too detailed a survey in order to keep the costs down. The Chief was concerned that the Division Engineer, Colonel Gustave R. Lukesh, did not exercise sufficient supervisory control over the work of the district engineers. Colonel Lukesh preferred to give the district engineer maximum latitude in arriving at opinions and conclusions. He then added his own views in an indorsement on the report. Lukesh's problem resulted partly from his own position as both the North Pacific Division and Portland District Engineer. In November 1929, the overworked colonel recommended that different officers be assigned to each position. “The special attention,” he wrote “needed for coordination and supervision of the Columbia River project studies in the Portland and Seattle districts is hampered by the detailed work imposed on the present division engineer by his district work . . . . With the added burden of the division the present incumbent is unable to give each meritorious item of his division and district work the attention it deserves.”<sup>10</sup> Eight months later, Colonel Lukesh was relieved of his duties as Portland District Engineer so that he could concentrate on his responsibilities as division engineer.

Based on the preliminary study, the Chief of Engineers authorized the additional work required for the comprehensive report. The compilation of data required extensive field work involving foundation investigations, stream flow studies, topographic and hydrographic surveys, and reconnaissance of irrigable and flood-prone areas. The resulting information was then coordinated with the investigations of the United States Geological Survey, the Bureau of Reclamation, and various specialized consultants. Lukesh ordered that the final report, containing 1,845 pages, present the data and cost estimates for

below: Colonel Gustave  
Lukesh





above, Map of the projects developed in the Columbia river drainage area as a result of the "308 Report".

proposed projects under the four elements—navigation, power, irrigation, and flood control—separately. Then the report was to combine the four features into a whole to support "the best plan." The proposed comprehensive plan and recommendations constituted the final sections of the report. In order to harmonize "the reports of the districts to avoid inconsistencies that would depreciate the report as a whole," he held a series of inter-district conferences with personnel from the Seattle District.<sup>10</sup>

As the 30 June 1931 date for submission of the final district reports neared, Colonel Lukesh drafted instructions on how to handle the economics of the study report. He wanted the district reports to harmonize their treatment of economics so that he would "not be forced to reconcile conflicting statements" in his submission to the Chief of Engineers. In order to produce "the best plan of improvement for all purposes" from the collected data and estimates of first cost, Lukesh felt it necessary to consider all economic factors:

*Although a plan as a whole may be wholly feasible from an engineering construction point of view, or from the point of view of meeting the requirements as to full utilization of the river's resources and potentialities, yet, unless the plan is economically feasible, it can not be recommended.<sup>11</sup>*

The economic costs Lukesh wanted considered included capital, maintenance, depreciation, operations, and interest. Above all, in arriving at "the best plan," engineering considerations remained secondary to the economic feasibility of the recommended projects.

The conclusion of the 308 report, as submitted by the Division Engineer, reflected a real change from the 19th century justification for improvement of the Columbia River. While the fundamental rationale for the expenditure of federal funds remained the navigability of the Columbia River, the test of public necessity had shifted. It was enough, during the 19th century, to justify federal improvement of waterways if it could be argued that such work would result in the reduction of competing transportation rates and promote further regional development. By the 1920s, the narrowness of such an approach was evident, particularly if little or no freight actually moved on the waterway—as was the case with the Columbia above Portland at that time. As Colonel Lukesh noted, "the expenditure of funds . . . on river improvement for navigation whose only or main effect will be a reduction of rail or truck rates with the river failing to carry its quota of freight is a cumbersome and uneconomic procedure." He went on to state:

*There is no gain in national assets to offset Federal funds consumed in a river improvement that leaves the river unused for actual freight movement, though*

*there may be a benefit to a fortunate section of the public. In determining the amount of contribution of Federal funds appropriate to a river improvement no credit should be taken for freight savings unless effected on freight actually moved on the waterway.<sup>12</sup>*

Structures built to improve navigability also had applications for power generation, and the Columbia was recognized as a stream of vast power possibilities. Thus according to Lukesh, "while navigation possibilities sanction the report, . . . the power possibilities of the stream may be considered the basis of this report."<sup>13</sup> Potential use of the Columbia for irrigation and flood control played a less important role in the proposed plan for comprehensive development of the river. The construction of dams would rest chiefly on considerations of power development.

The 308 report recommended a ten-dam comprehensive plan for the Columbia River, with Grand Coulee as the key upriver project and a dam near Bonneville as the lowermost in the chain. The report also included much data on the resources and industries of the Pacific Northwest. This information, as well as an overly cautious analysis of future power usage of the region, soon became dated. Nevertheless, the document's concise presentation on dam sites formed the basic plan for the Columbia River's development over the succeeding 40 years.

The Board of Engineers reviewing the district and division report generally concurred in the findings of the division but urged development of the power potential of the river by private interests, states, or municipalities. The Board stated that the federal government's contribution should be limited to the cost of the locks and channel improvements necessary to take advantage of the slack water navigation provided by the power dams below the mouth of the Snake. National economic events would soon make obsolete such a recommendation concerning the general government's role in financing the development.

While engineers made plans to harness the great energy of the Columbia River, the United States became mired in the Great Depression. Thirteen million persons were out of work, commerce was nearly paralyzed, bankruptcies and mortgage foreclosures were rife, the agricultural scene was chaotic, and savings were wiped out. Public discussion of this took center stage in the presidential campaign of 1932. Franklin Delano Roosevelt promised a "New Deal" for the American people.

In September 1932, candidate Roosevelt spoke in Portland. He stated his interest in the "vast possibilities of power development on the Columbia River." He promised that if elected "the next hydroelectric development to be undertaken by the federal government must be on the Columbia River." Though in the midst of a crowded campaign schedule, Roosevelt insisted upon being driven east along the Columbia so he could see for himself the site of the future Bonneville Dam.<sup>14</sup>

The great public benefits from government investment in the hydropower potential of the Columbia River, the need for relief work to overcome massive unemployment, and the election of Roosevelt provided a climate favorable to funding the Bonneville Dam. However, other public works projects also competed for the limited dollars available. Only strenuous lobbying by Oregon Senator Charles L. McNary and Representative Charles H. Martin secured the funds initiating work on Bonneville Dam in 1933. Even at that, the primary justification for the dam was improvement of navigation on the Columbia River; power generation was a secondary consideration. Title II of the National Industrial Recovery Act continued the Federal Emergency Administration of Public Works, and this agency became the vehicle for funding construction of Bonneville Dam as public works project number 28. In August 1935, Congress formally authorized the project, putting it under the regular appropriations process instead of the presidentially-designed emergency funding system. The dam was to be built by the Corps of Engineers in accordance with the plan presented in the House Document 103.<sup>15</sup>

## Bonneville Dam

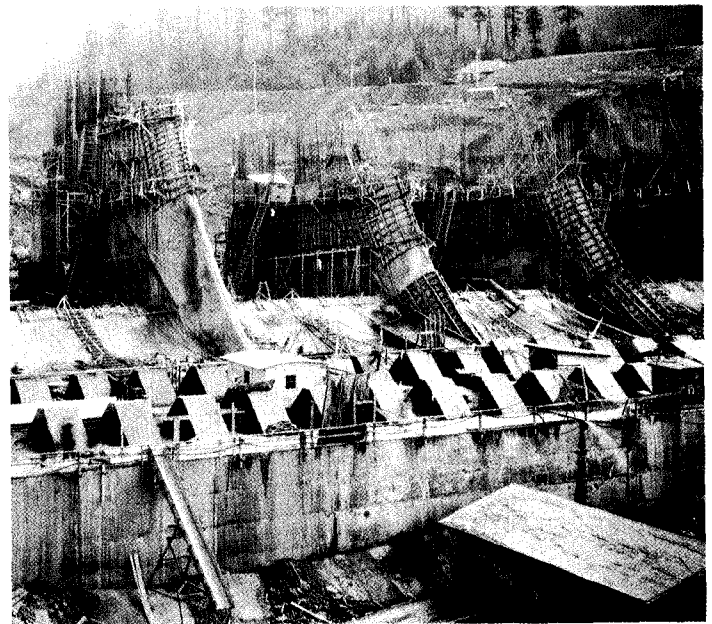
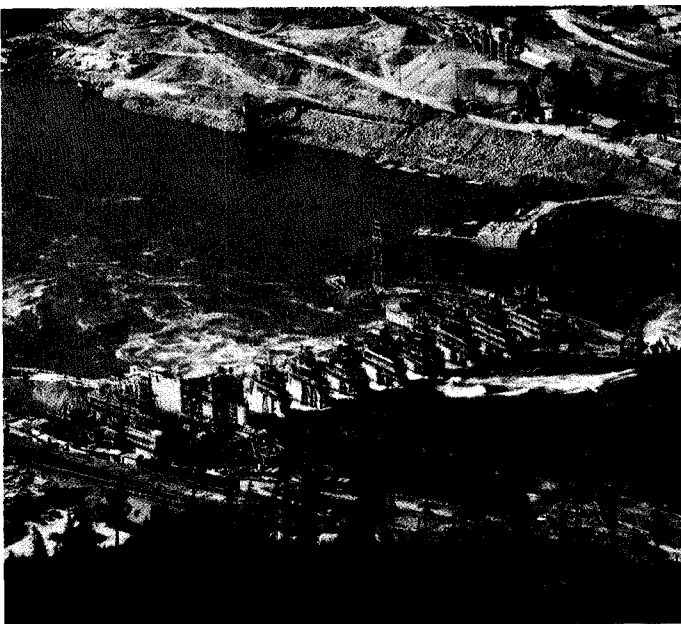
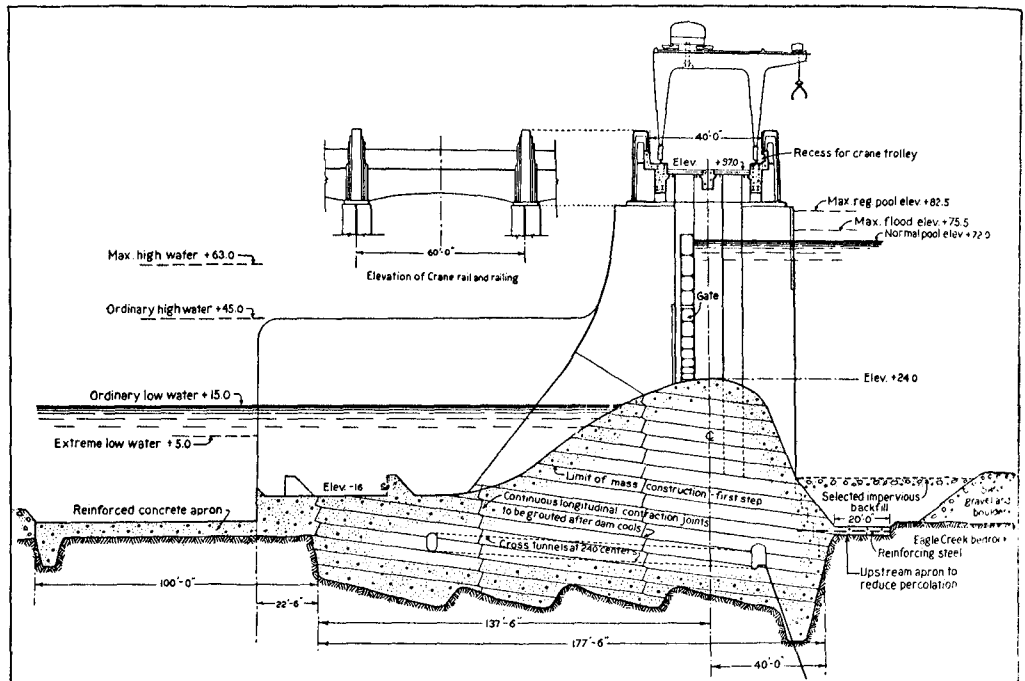
Proposed as the first federal dam on the Columbia River in the early 1930s, Bonneville emphasized the Columbia's potential as the greatest hydroelectric power stream in North America. About 40 percent of the nation's potential hydropower lay in the Columbia River system alone. This fact stems from the river's great volume, and by its rapid rate of fall—two to five feet per mile of flow. The Columbia's flow is ten times that of the Colorado River. Rising in the Canadian Rockies, the river travels 1,210 miles to reach the Pacific Ocean and drains an area of 259,000 square miles. Along its journey it is fed by a number of tributaries which are themselves important rivers, such as the Yakima, Snake, John Day, Deschutes, Willamette, Lewis, and the Cowlitz. The ten-dam plan described in the 308 report was designed to use for power development all but 95 of 1,288 feet of total river head below the International Boundary. As a key part of this plan, the dam and navigation lock at Bonneville were located so as to create a pool of water with a sufficient vertical fall distance to operate the dam's large hydroelectric turbine-generator units and with enough slack water to cover the Cascade Rapids and accommodate ocean-going vessels 48 miles upstream to The Dalles.



The design of Bonneville Dam presented a number of engineering challenges. The dam had to cope with a wide variation in stream flow. The engineers dealt with this difficulty by using a relatively low sill and handling the overflow by exceptionally large steel gates set in the deep slots between the structural piers. Two 350-ton gantry cranes traveling on top of the dam operated the special mechanisms which lifted the gates. When raised to their full open position, the spillway could pass a flood of 1.6 million cubic feet per second—37 percent greater than the maximum recorded flood of 1894. The foundation materials proved susceptible to shear or scour, so to create a safe foundation the dam was designed to support a load not to exceed 110 pounds per square inch and locked to the bedrock by a series of steps or notches to prevent the sill from sliding. Finally, to lessen the destructive energy of the large water flows through the gates, the designers installed a double row of reinforced concrete baffle piers, shaped the overflow section to insure the formation of a hydraulic jump on the deck of the dam, and used a wide concrete apron at the toe of the spillway section.

The plans drawn up by the Corps of Engineers for the huge project called for two separate structures. The spillway section proper, on the north side of the river, was to be 1,090 feet long, 200 feet wide, and 170 feet high above the lowest point of bedrock excavation. Bonneville Dam is technically described as a concrete gravity, ogee crest, gate-controlled structure. Eighteen 50 by 50-foot spillway gates were installed to regulate a pool

right: Section diagram of the Bonneville spillway, below, left: Construction of Bonneville spillway progressing across the Columbia; below, right: Spill bays take shape as construction continues.



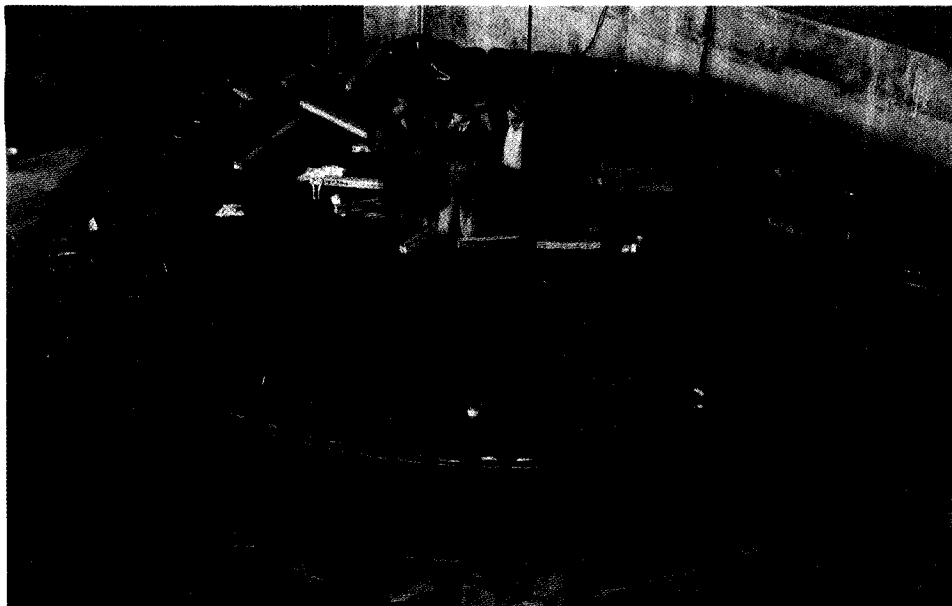
which had a maximum elevation of 72 feet above mean sea level. Columbia Construction Company, and later Guy F. Atkinson, Inc., were awarded contracts for construction of the spillway dam. Excavation work began in June 1934.

Between Bradford Island and the Oregon shore is the powerhouse. It is 1,027 feet long and 190 feet in width and height. An earth fill levee on Bradford Island connects the powerhouse and the spillway dam. The electrical engineers worked under difficult circumstances, with the design and construction of the powerhouse structure occurring before the actual electrical load and means of meeting it had been determined. The engineers had to design a plant without knowing the type of equipment which would be used. Construction was pushed along at a frantic pace. According to at least one frustrated electrical engineer, "the only objective apparently being the dumping of yards of concrete and the placing of tons of steel."

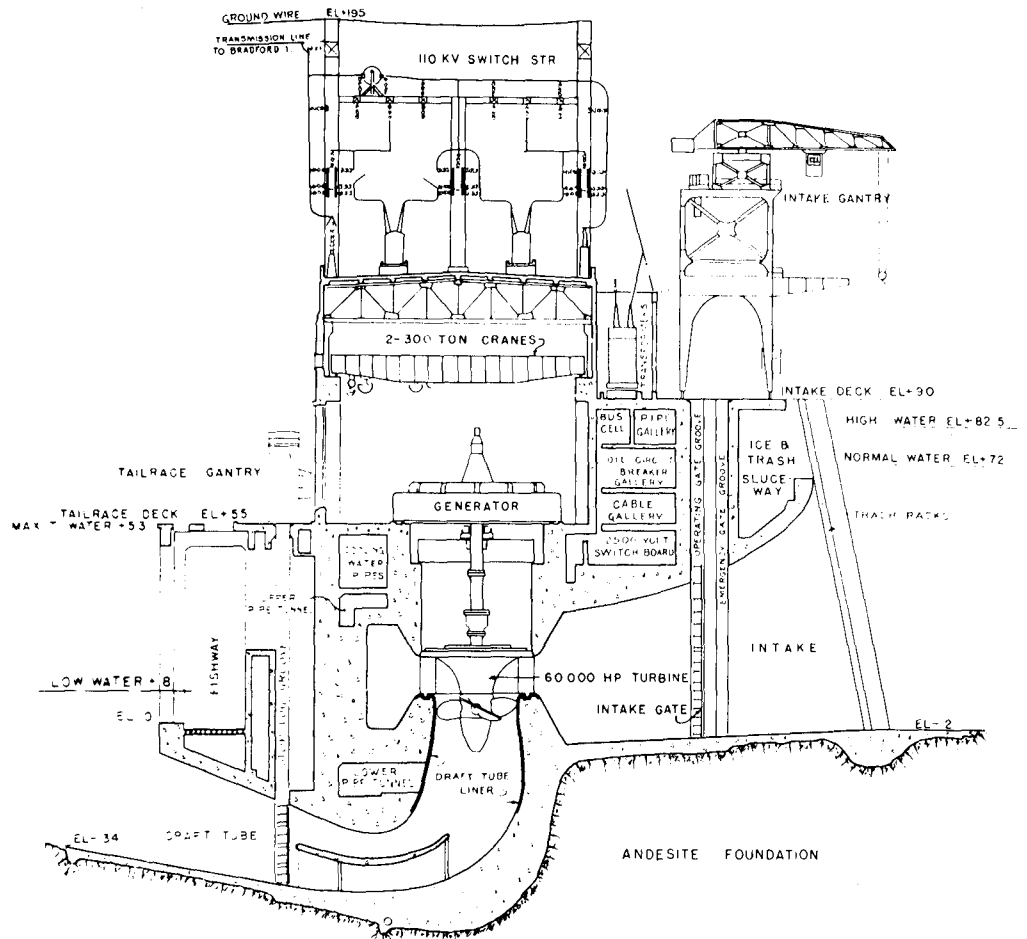
After beginning operation with two generating units of 43,200 kilowatts each, eight others rated at 54,000 kw were eventually added. The ultimate total output of this first powerhouse—518,400 kw—would have satisfied the electricity needs of a city three times as large as Portland in 1935. Each of these generators was equipped with an adjustable-blade Kaplan turbine, which was especially well suited to handle the wide range of operating head created at the powerhouse. The design called for wicket gate openings and turbine blade slope automatically controlled by a governor in the generating unit. This allowed the most efficient use of water passing through the powerhouse. General Construction Company and



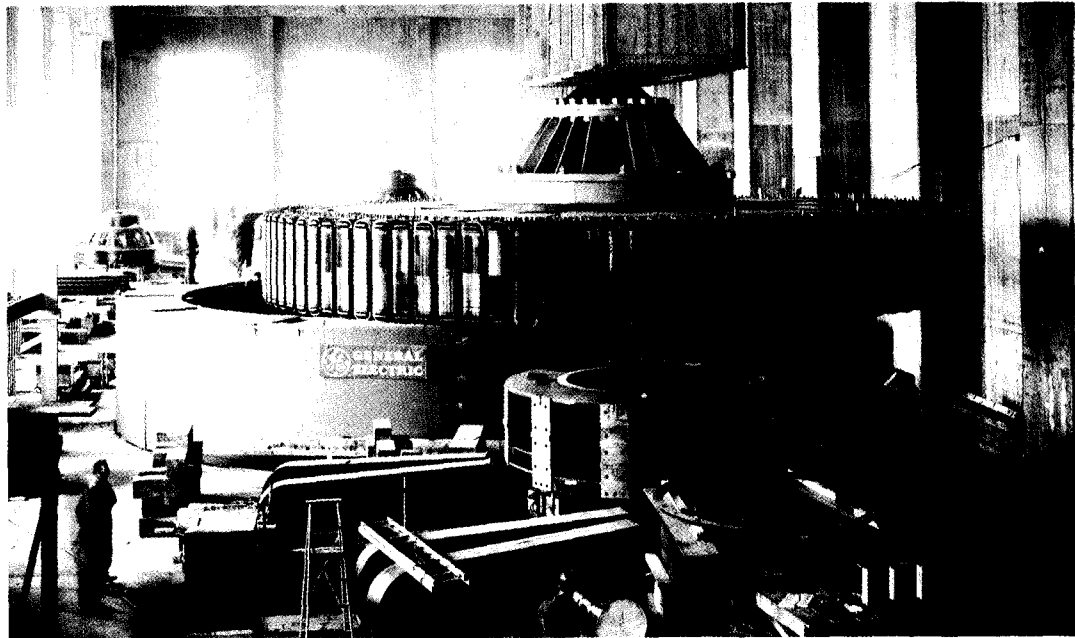
*Generator awaiting assembly  
in Bonneville powerhouse.*



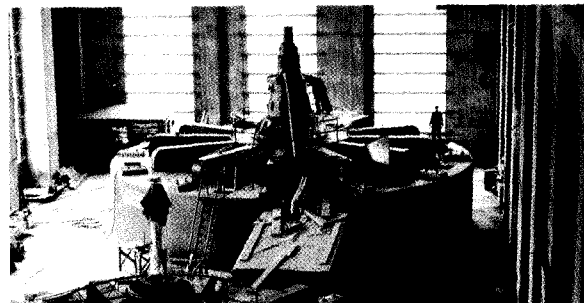
*Rotor section of generator  
before installation.*



Section diagram of Bonneville powerhouse.



Rotor section of generator moved into place.



Generator assembly nearing completion.



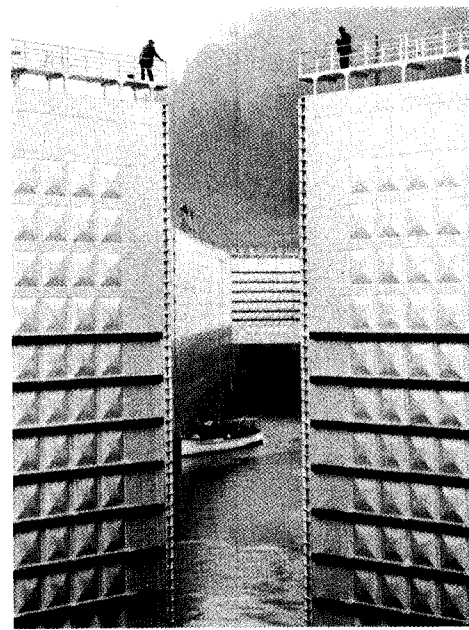
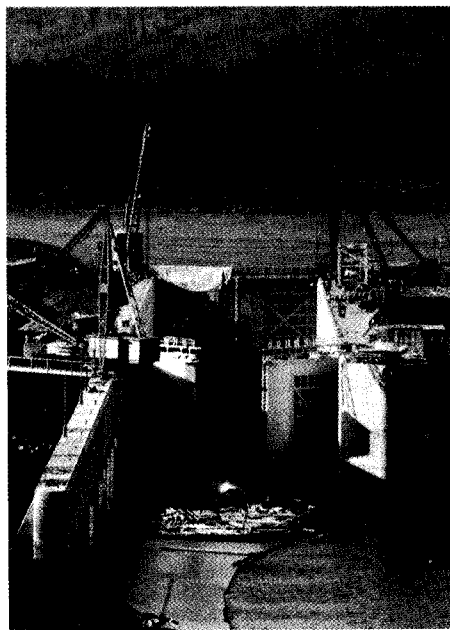
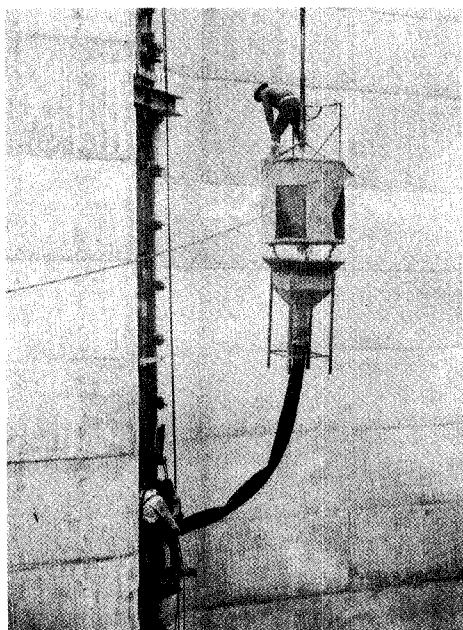
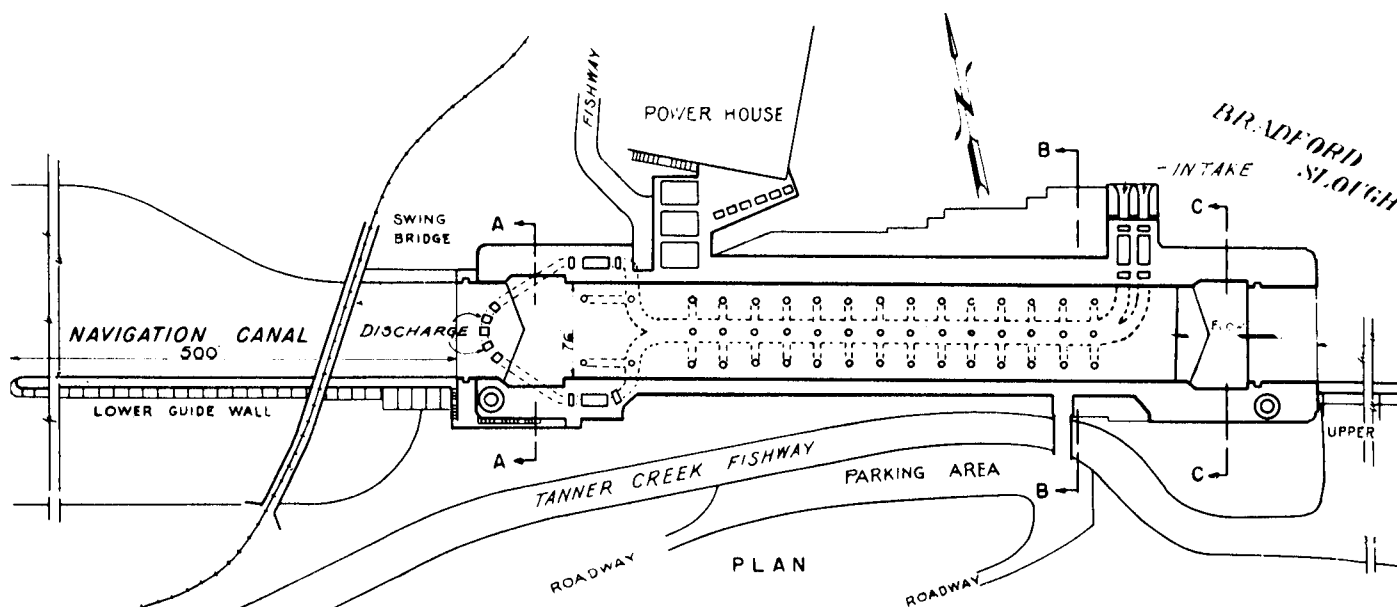
J. F. Shea Company received the contract for the powerhouse. They began excavation in February 1934 and actual construction in July 1934.

The single-lift navigation lock on the south shore is 500 feet long, 76 feet wide and 26 feet in depth over the sills at low water. With a lift capability of 66 feet, it can handle ships weighing up to 8,000 tons. Work on the navigation lock began in July 1934 by the same contractors working on the adjacent powerhouse. At the time of construction the Bonneville lift lock was the largest single-lift lock in the world, with the lower mitergates measuring 102 feet high. An unusual feature of the navigation lock was the use of six floating mooring bits in the lock walls. Designed by the Assistant Chief of Engineers, Brigadier General John Kingman, the floating fixtures enable small craft to overcome difficult and dangerous moorings at low stages of the river.

Designing effective fish-passing facilities at Bonneville Dam called for special effort by the Corps of Engineers. At stake was the very existence of the highly valuable Columbia River fishing industry. The solutions provided for this problem by the Portland District will be discussed in a later chapter.

The Construction of the dam itself posed severe problems. The depth of water, current velocity, and harsh weather conditions that limited working time led to the adoption of massive cofferdams to divert the river. First, a horseshoe-shaped timber crib cofferdam enclosed the south half of the spillway section site. After the south spillway's partial construction, the cofferdam was removed and the river diverted through it while another cofferdam was put in place for work on the north section. Following completion of the

*below, top: Plan diagram of Bonneville navigation lock; lower left: placing concrete in lock wall; lower center: lock construction nearly completed; lower right: lock gates tested.*



entire north section, the contractors placed a pre-fabricated structural steel cofferdam over the crest section between the piers of the uncompleted south portion so that these units could be brought to final elevation.

One unique feature of the crib construction was the need to "tailor" the crib bottoms to fit the irregularities of the river bed, since levelling would have resulted in excessive cost and loss of time. As the contractors completed the crib sections, they floated them into position and sunk them by dumping rock into their cavities. The builders used traditional, earthfill cofferdams, one upstream and one downstream from the foundation area, in the construction of the powerhouse and navigation lock.

The original Warrendale site for the Bonneville Dam was rejected after the Corps of Engineers found a better location about four miles upriver. The new site provided a rock foundation instead of the unconsolidated sand and gravel at Warrendale. Drilling and construction of the cofferdam had begun in October 1933 at Boat Rock, several hundred yards upstream from the present location; but a flood in December 1933 stopped work. Further drilling during the work stoppage demonstrated the superiority of the present Bonneville site. In February 1934, work began anew at the present location with an initial allotment of \$20,240,700.

To facilitate construction of the Bonneville Dam, the Chief of Engineers ordered organizational changes in the Portland District. A resident engineer's office was set up immediately at the dam site; and in May 1935, the Portland District split into two units. The First Portland District remained in Portland and the Second Portland District now had primary responsibility for the dam construction, the Snake River Basin, and the Columbia River Basin between the mouth of the Snake River and Vancouver, Washington. In July 1937, the names of the units were changed to the Portland, Oregon, District and the Bonneville, Oregon, District. After completion of the dam, the Bonneville District was reconsolidated with the Portland District in 1941.

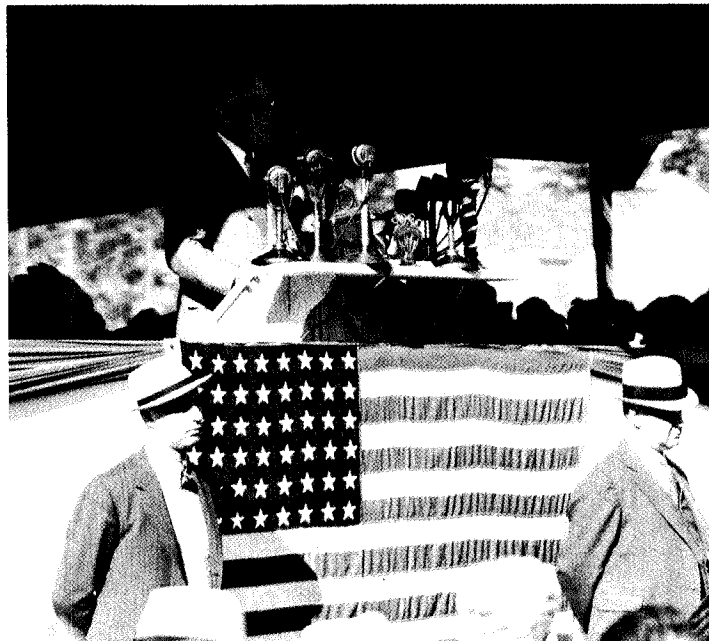
At the beginning of the Bonneville Dam project, Lieutenant Colonel Charles F. Williams was District Engineer of the Bonneville District. Shortly, Major Theron D. Weaver succeeded Colonel Williams. The engineer with direct responsibility for the project was C. I. Grimm, Chief of the Division's Engineering Branch. Among the many Corps of Engineers officers who were assigned to the important project were Lieutenant William F. Cassidy and Lieutenant Charles H. Bonesteel, III. Both men later became Lieutenant General: Cassidy as Chief of Engineers and Bonesteel as U.S. Commander in Korea in the mid-1960s.

The location of the dam and the size of the pool behind it required substantial relocation work. The Union Pacific Railroad track on the Oregon side and the Spokane, Portland, and Seattle Railway track on the Washington side, plus sections of Washington State Highway 8 had to be moved to higher ground. The Corps of Engineers had to build a 620-foot concrete-lined double track tunnel through Tooth Rock for the railroad on the south side of the Columbia, and devise a heavy riprap wall with several drainage tunnels to stabilize a troublesome slide area over which the railroad had to pass.

The closure of the spillway dam was accomplished in September 1937. At this time, top civilian and military figures in the national government formally dedicated Bonneville



*above: Plaque at Bonneville project.*



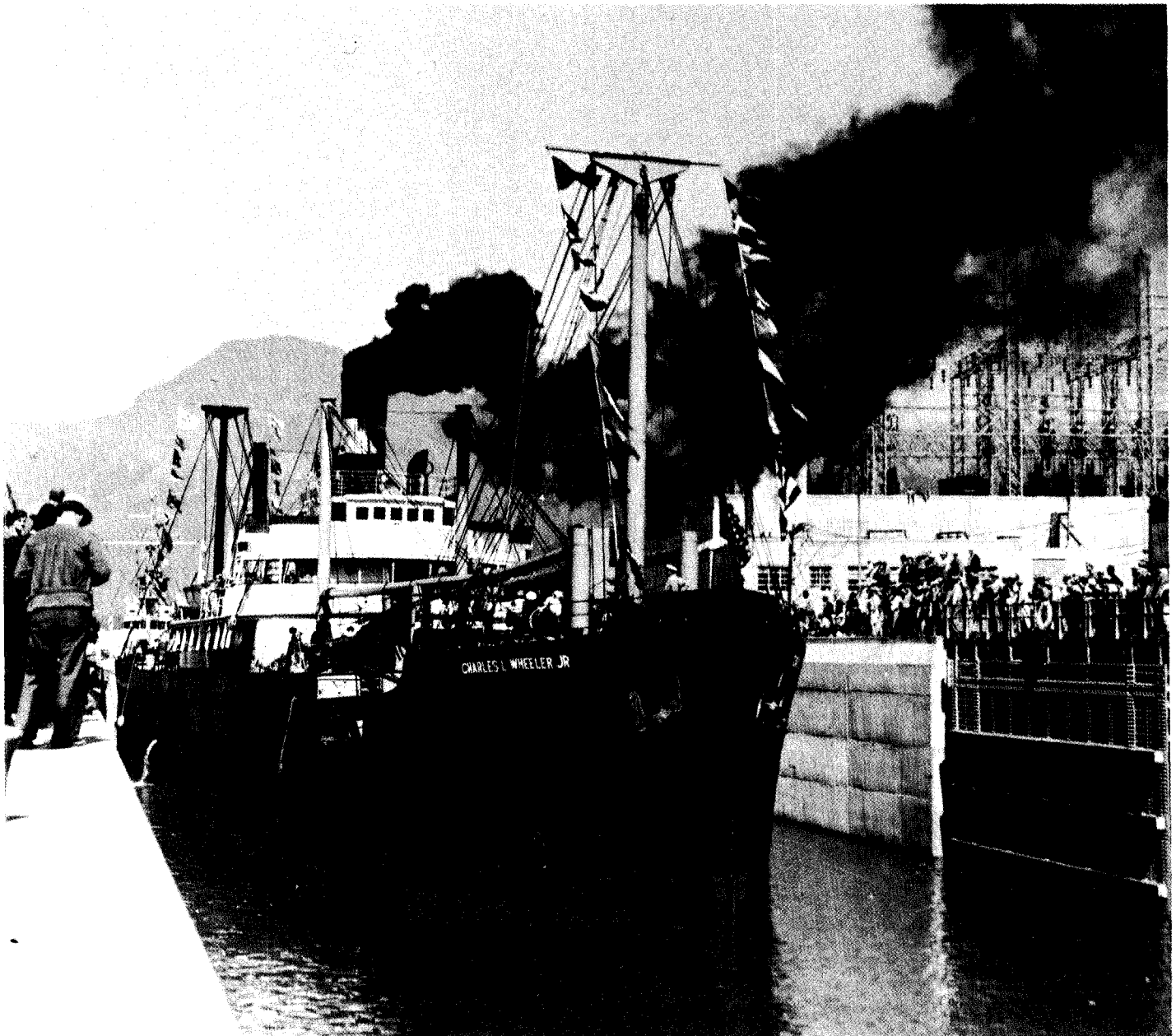
*President Franklin D. Roosevelt officially dedicated Bonneville in September 1937.*

Dam. Before a large crowd and assembled dignitaries, President Roosevelt dedicated the dam to "a policy of the widest possible use of electricity," and to "more wealth, better living and greater happiness for our children." The President pushed a button to electrify a string of light bulbs which adorned the speakers' stand. According to Brigadier General Theron Weaver, at that time the district engineer in charge of the Bonneville project, the lights almost did not go on because of a scheduling mixup. As Weaver later described the situation, "I was down there sweating blood because I couldn't raise the powerhouse or get anything, and just at the last second, somebody had enough sense and did go up on the operating floor and turn the power [on]."<sup>17</sup>

The contractors finished the navigation lock early in the next year; and by March 1938, the first two generators produced power. The original plan called for the powerhouse to contain six generating units with expansion capacity to ten units as energy requirements dictated. Even before completion of the first two units, the need for additional generating capacity was apparent. The expansion of the powerhouse proved a difficult job because the excavation for the foundation required digging well below sea level behind a temporary earth and rockfill cofferdam which was not water-tight. Major General Cecil Moore, then distict engineer, later recalled that "it was a great relief when they finally got the excavation done and that base foundation in down there because if that thing had gone out, well, then you would have lost . . . that whole power plant." Work on the expanded powerhouse was completed by December 1943.<sup>18</sup>

*below: Bonneville Lock  
opened with fanfare in June  
1938.*

Excitement and formal ceremony marked the official opening of Bonneville Dam on 9



## Marketing Hydroelectricity

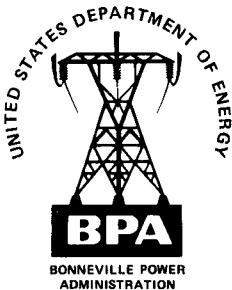
July 1938. The Chief of Engineers, Major General Julian L. Schley, attended along with the North Pacific Division Engineer, Colonel John C. H. Lee, and Major Weaver. Secretary of the Interior Harold L. Ickes threw the switch for the first delivery of electric power for commercial and municipal use to the City of Cascade Locks. A microphone connected with the public address system was placed deep in the powerhouse structure to pick up the sound of the turbines as they whirled around.

The *S. S. Charles L. Wheeler, Jr.* was the first ship to pass through the navigation locks. When the water reached its full height, the ship's crew performed a flag ceremony on the deck of the ship. As the ship passed through the locks, the master of ceremonies grandly announced to the crowd that, "ships are now passing through the heart of the Cascades Mountains and entering into the Inland Empire."<sup>19</sup>

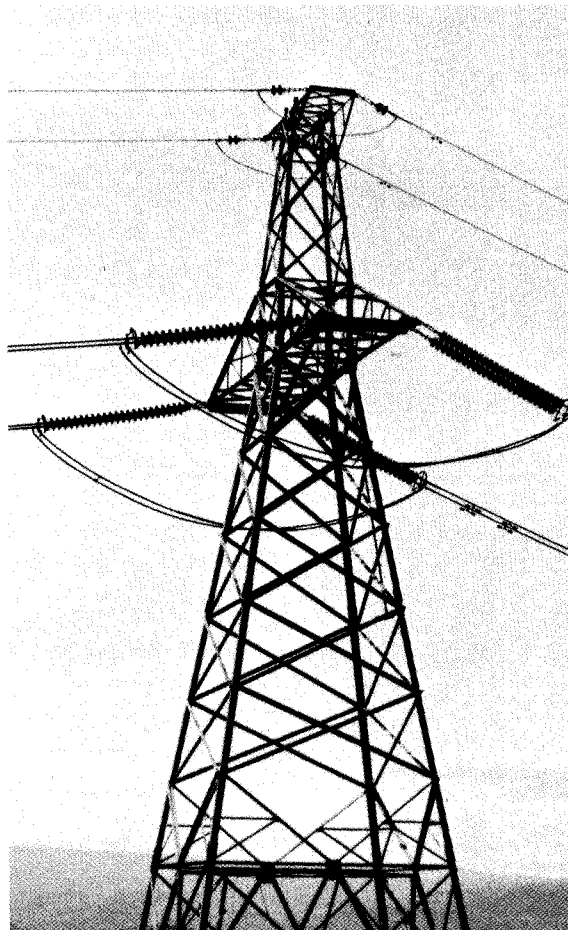
The construction of Bonneville Dam by the Corps of Engineers and erection of the huge irrigation and hydroelectric project at Grand Coulee by the Bureau of Reclamation made available vast amounts of federally-produced hydroelectric energy. Long before Bonneville and Grand Coulee had been completed, distribution of this electric power became a controversial issue.

Some interests in the Pacific Northwest wanted a public agency, such as a Columbia Valley Authority, to generate, market, and transmit the electric power, while others wanted the Corps of Engineers to sell the power at the generator bus to whomever would purchase it. Colonel Robins, North Pacific Division Engineer, opposed a uniform rate for the sale of Bonneville power, arguing that it would drive up the average cost of power and thus discourage industry from locating in the region. In this same vein, the Portland Chamber of Commerce wanted a cheap rate for power as far as the Portland-Vancouver area to encourage industry to locate there but higher rates for greater transmission distances. People elsewhere in the region argued instead for a blanket or uniform rate, regardless of the distance from the dam. The latter group wanted the power distributed for maximum regional benefits.

The Bonneville Project Act, passed by Congress and signed by President Roosevelt in August 1937, ultimately resolved the question of marketing federal power. The Act delegated to the Corps of Engineers responsibility for generating the power but rejected proposals simply to sell the power at the dam site to those able to come and get it. Rather, a federal marketing agency, the Bonneville Power Administration (BPA), was established to



above: Bonneville Power Administration logo. right: BPA transmission towers enable power to be transported to a market.



sell power in accord with the policy of "widest possible use of available electric energy," and with preference given to publicly and cooperatively owned distribution systems. The terms and conditions of the sale of hydroelectricity by the Bonneville Power Administration were designed to prevent monopolization of this vital resource by limited groups. The performance of the Bonneville Power Administration would provide a "yardstick" by which the activities of other electric utility systems in the Pacific Northwest could be measured.<sup>20</sup>

Congress established the BPA as a bureau of the Interior Department. Its administrator was empowered to construct and operate necessary transmission and substation facilities, and to enter into power contracts of 20-year duration. The administrator was also authorized to set rates consistent with the policy of the Act and sufficient to reimburse the United States Treasury for the costs of power generation and transmission facilities. Congress further ordered that the Federal Power Commission determine the cost allocations and approve rates. It became BPA policy to sell the power at a uniform rate along the entire transmission system. At Bonneville Dam, and eventually at other federal dams built in the Northwest, the Corps delivered electricity to the BPA at the converting facilities on the powerhouse. Electric energy requirements during World War II resulted in the rapid growth of the BPA.<sup>21</sup>

The total cost of the Bonneville project amounted to \$83,239,395. Some had argued that such an investment would be a waste of money. As J. D. Ross, newly appointed BPA administrator, noted to President Roosevelt in 1938 "there has been a tremendous propaganda trying to picture Bonneville and Coulee projects as white elephants." Ross confidently predicted to the President that "the operation of Bonneville just beginning is going to dispel the manufactured remarks of these crepe hangers." "Dam of Doubt," an article in the June 1937 issue of *Collier's*, was typical of this view. The piece claimed that there is no "real need for Bonneville," and that "there is no market remotely in sight for the power" from Bonneville Dam. The article spoke of the possibility of "fine concrete monuments scattered up and down the wilderness of the Columbia Gorge, still being paid for by the taxpayers." The Grand Coulee project was the object of similar criticism by others.<sup>22</sup>

Collier's for June 19, 1937

## Dam of Doubt

By Jim Marshall



**Take a look at Bonneville. It's the \$31,000,000 dam that turned out to cost \$75,000,000. It's the first step in the government's scheme to turn the Columbia River gorge into a hive of industry. When completed the project will be five times as big as the TVA. And how about industry? Where is it coming from? That's what the sober Northwest wonders...**



**Bonneville Dam, key unit in the billion-dollar federal power project Planned for the Columbia River. Below, aerial view of work to date**

**THE GOVERNMENT,"** said Mr. Ben Clark judicially, "says it's going to give us farmers around here cheap power from this dam. Sure, and why not? The private company'll give me all the cheap power I want. All I've got to do is plant about sixty poles and string three or four miles of wire to the plant and I can buy power for three or four mills a kilowatt-hour. Most any private company out here'll sell you juice for that, if you'll pay for the distribution from the bus bars."

We sat on the front porch of Mr. Clark's unpainted log house, two miles up a sloping narrow valley and a thousand feet above the swirling Columbia River, coasting through its 2,000-foot gorges. Down by the river a broad highway swept in curves along the Washington state shore. Across the stream, the Oregon hills rose dark and tree-covered. The wind spoke softly in the firs and pines and hemlocks back of Ben Clark's house. If you listened, you could hear the gurgle of falling water and the soft hum of spinning machinery.

"I've got a power plant, too," said Ben Clark. "Built it myself. You want to see it?"

Fifty yards back of the house, where the valley narrowed, a rugged little dam of timber, rocks and earth held back the water in a pool. A few lengths of galvanized pipe led into a small stone building. Inside, the water rushed over a wheel. Through gearing, the wheel spun a generator. From the little plant, electric wires led to the house and the barn.

"West little rig," boasted Mr. Clark, squirting oil at it. "I ain't had any trouble with it and it costs hardly enough to coast. Most any farmer can build one, if he's got a creek on his place, and most of them have, in these hills."

We came out and walked back down the hill to the house.

"The catch in a lot of these power schemes," said Ben, "is the distribution cost. I've got almost none—but if this plant was four miles away over in the next valley, it'd be worthless to me. Couldn't afford to plant poles and string wire and spend half my time maintaining the line."

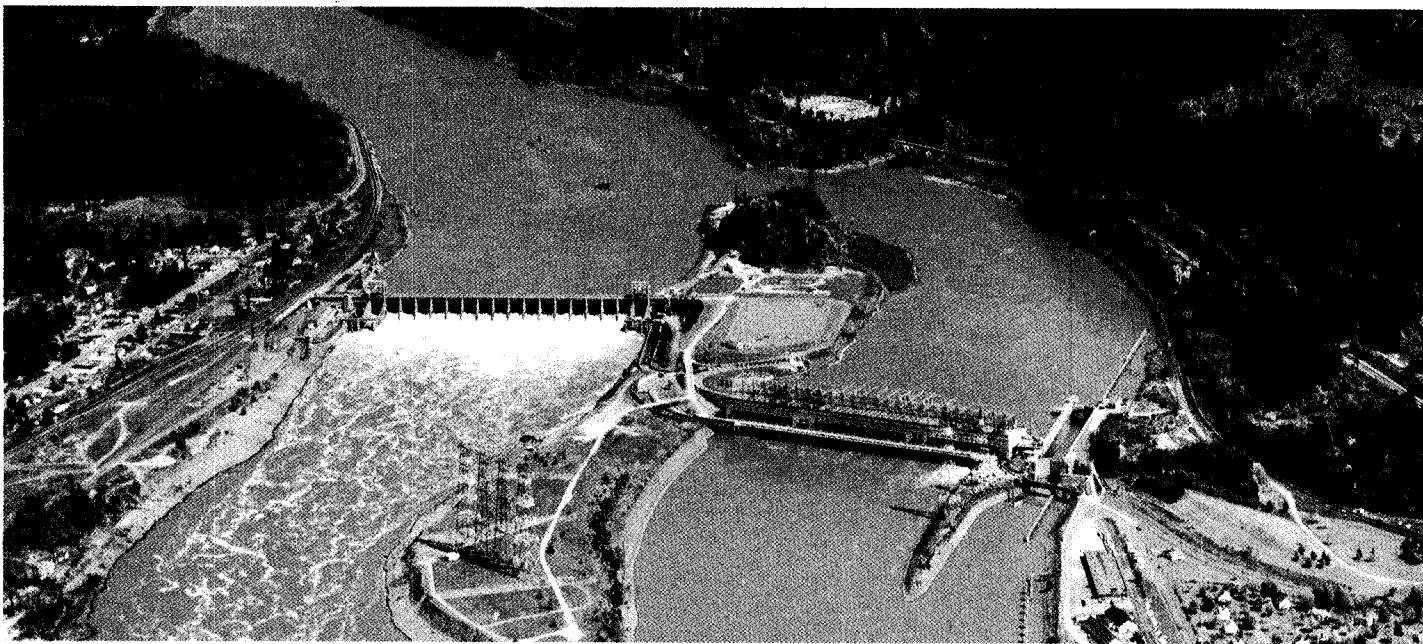
We sat on the front porch again, looking out over the prune orchard that makes a living for Mr. Clark when the price of prunes is right and there is a good crop, which happens once in a while. Far below, lights twinkled in the twilight of the gorge. Down there, \$75,000,000 of your money, transformed into steel and concrete, was finishing the building of Bonneville Dam. The dam, gray in the half-light, set out from the Washington shore, pointed on an island near midstream and leaped for the Oregon cliffs on the far side. With a glance, you could see the elaborate lines of three fish ladders, designed to preserve the lower river's \$10,000,000 salmon industry by allowing the fish to get upstream to their spawning grounds far in the Canadian Rockies. Toward the Oregon shore a long narrow rectangle marked the ship lock, through which it is hoped ocean carriers will steam forty miles up the river for freight.

Bonneville is the first and key dam of the Columbia River development scheme—which is about five times the size of the TVA project in the South. Second dam finished will be the Grand Coulee dam—a little \$60,000,000 job to "hook" power in the wilderness," described in Collier's by Walter Davenport in the fall of 1935. Present plans call for eight other dams; the final cost of the whole layout will be nearly a billion dollars.

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Article from Collier's magazine questioning need for cheap hydropower in Pacific Northwest.





*above: Overview of  
Bonneville project after  
completion.*

Events soon proved the critics incorrect. Power requirements during World War II used all available capacity; indeed occasionally the generators worked above their nameplate capacity. Since the war, the Corps of Engineers and the Bonneville Power Administration have had to construct many generation and transmission facilities to meet the ever-growing demand for power in the Pacific Northwest. Revenues from power sales are used to repay the U.S. Treasury for the full cost of building, operating, and maintaining power facilities—including interest payments on these costs. Unlike most other government programs, the power produced at Columbia River dams pays for itself through BPA revenues.<sup>23</sup>

Navigation at Bonneville Lock increased greatly over that which had used the Cascade Canal and Locks. From 1922 to 1933, cargo shipped upriver from Bonneville averaged less than 5,000 tons per year. In the four years after completion of the dam and lock in 1938, freight went from 161,000 to 923,000 tons. For five years thereafter until 1947, river traffic averaged about 750,000 tons. The ability of large barge tows to go upstream made shipping on the river economically possible. Unit costs of smaller vessels had not been competitive with railroads. The construction of dams and navigation locks further upstream after World War II increased the value of the work done at Bonneville Dam. Such improvements would also extend the multi-purpose development of the Columbia River started at Bonneville in 1933.<sup>24</sup>

## **Hydraulic Laboratory**

In connection with the design and construction of multiple-purpose dams and navigation channel improvement plans, many problems arose which could not be solved by theoretical analysis or past experience. Solutions to these problems were sought in the Portland District Hydraulic Laboratory built at Bonneville, Oregon, simultaneously with the dam. Completed in 1938, the laboratory has made studies on approximately 100 models of such projects as Bonneville, Mud Mountain, Lookout Point, Howard Hansen, Dorena, Chief Joseph, The Dalles, John Day, and Ice Harbor.

At the laboratory, comprehensive hydraulic model studies are conducted on general layouts of projects; sectional models test navigation locks, spillways, fishways, conduits, and valves. The structure and layout of each model and all hydraulic quantities are to scale, ranging from 1 to 100 in the general models to 1 to 4 in tests of detailed structures. Studies of fish passage facilities are an important part of the laboratory's work. A major expansion of the laboratory occurred in 1963, when its operation was shifted from the Portland District to the North Pacific Division.

The Portland District entered the 20th century phase of its work through the multi-purpose development of the Columbia River Basin. The rivers and harbors projects initiated in the 19th century continued as important components of the district's mission. To these were added the new emphasis on power development and flood control, especially on the Columbia and Willamette Rivers and their tributaries. Preservation of the endangered fishruns on the region's multi-purpose rivers and other environmental concerns would continue to challenge the Corps in this new era.